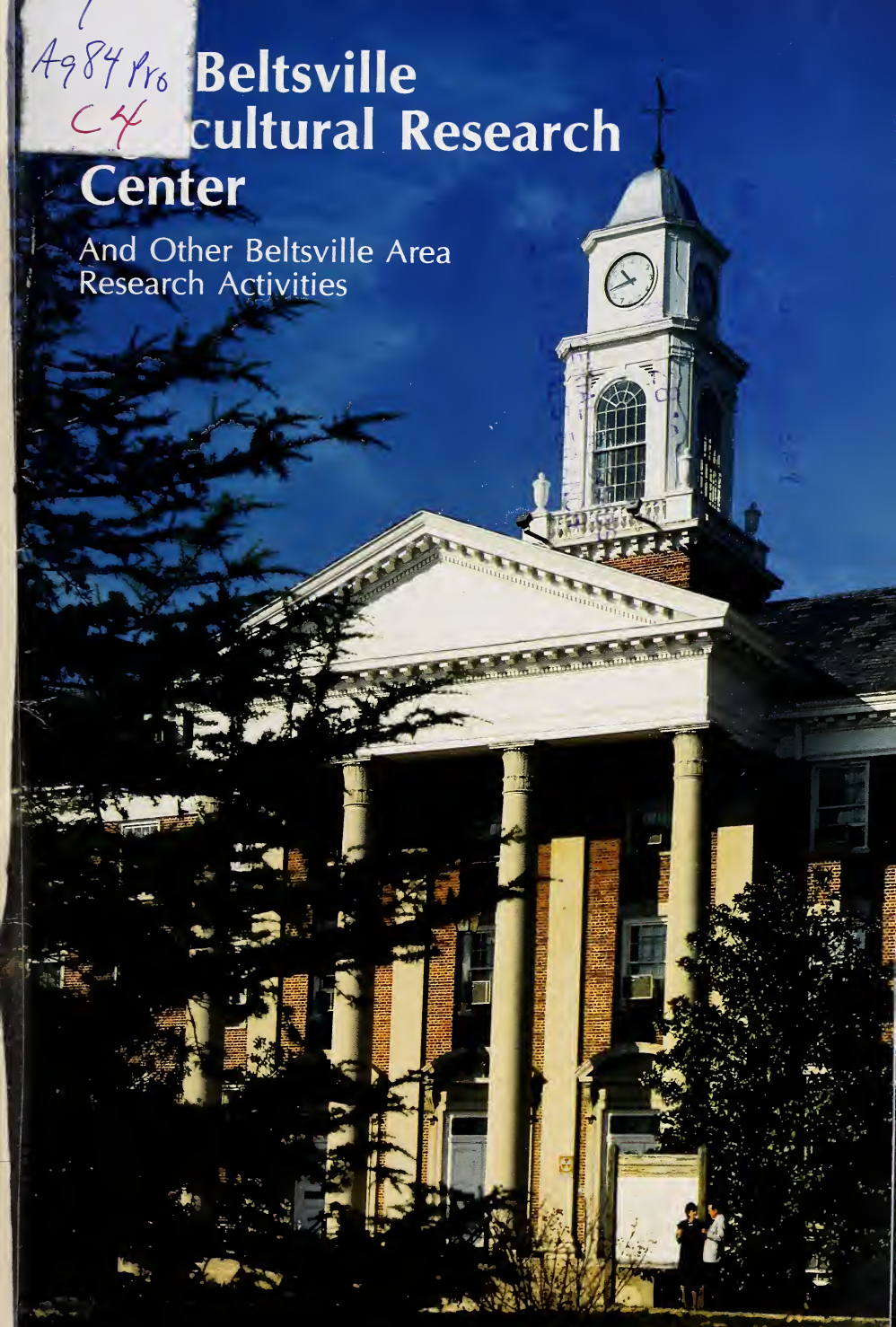
Beltsville cultural Research Center

And Other Beltsville Area Research Activities



United States Department of Agriculture

PREPARED BY Agricultural Research Service

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How To Arrange Tours of BARC

Visitors to BARC may arrange for a guided tour by appointment.

To arrange for your guided tour, call (301) 344-2483 or write to:

Tour Coordinator
Building 186
BARC-E
Beltsville, MD 20705

The Center is closed to the public on Saturdays, Sundays, and holidays.

All telephone numbers in this brochure are FTS as well as commercial numbers. To call FTS, dial 8 plus the seven-digit number.

November 1987

United States Department of Agriculture
Agricultural Research Service

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Introduction

This publication briefly describes programs of the Agricultural Research Service (ARS) in the Beltsville Area. It lists the names and locations of the institute or center directors and research leaders with descriptions of their work. In addition, the functions of other USDA staffs located at Beltsville involved in Science and Education activities are described.

The Beltsville Area of ARS consists of five organizational units. They are the Beltsville Agricultural Research Center, the Beltsville Human Nutrition Research Center, the U.S. Plant Introduction Station in Glenn Dale, and the Family Economics Research Group in Hyattsville, all in Maryland, and the U.S. National Arboretum in Washington, D.C.

The Beltsville Agricultural Research Center (BARC) is among the largest and most diversified agricultural research complexes in the world. The Center began in 1910 when the U.S. Department of Agriculture purchased a 475-acre farm about 15 miles northeast of Washington, D.C., to conduct research on animal husbandry, dairying, and animal diseases. During the following years more acres were added to the farm and more research projects to its program. By 1941 the Food and Nutrition Division of the Bureau of Home Economics was located at Beltsville, followed in 1942 by the Bureau of Plant Industry.

Land was purchased for the U.S. Plant Introduction Station at Glenn Dale, in 1919. Traditionally, Station operations emphasized the collection, importation, propagation, evaluation, and distribution of clonally propagated fruit and nut, ornamental, and vegetable crops from foreign countries. Today, the Station's research and service activities focus on the development and implementation of more effective methods of plant propagation and plant pest identification and elimination.

The U.S. National Arboretum was established by an Act of Congress in 1927 as a research and education institution for the improvement of plants through exploration, introduction, breeding, and selection. The Arboretum today occupies 444 acres in the Mount Hamilton section of the District of Columbia. Its higher hills overlook the Capitol and the Washington Monument to the south, and break in dramatic drops to the Anacostia River in the east.

Today, more than 2,500 USDA employees and 200 employees from other Federal agencies work in Beltsville in about 800 build-

ings—research laboratories, greenhouses, barns, poultry houses, shops, and offices. More than 7,000 acres of land are used for these research activities.

About 900 of the employees are scientists and technicians who specialize in a wide range of subjects. Animal researchers study livestock diseases, animal nutritional needs, and animal genetics and physiology to improve the productivity of cattle, poultry, swine, and sheep. Plant specialists are seeking greater crop yields by breeding plants that use light and nutrients more efficiently, that have built-in disease resistance, or that are able to cope with marginal growing conditions. Others develop new methods to fight plant pests and diseases, including use of nature's own resources—biological controls and naturally occurring chemicals—that are integrated with better cultural methods to safeguard the environment while reducing crop loss. Human nutritionists study the nutrient requirements for optimal health and identify the foods that meet these requirements. Still others work to ensure that meat, milk, and produce reach the consumer with all their natural taste and nutritional value.

Beltsville's record of accomplishments (see p. 7) has made it a leader in agricultural research. Its international reputation attracts thousands of visitors each year from the United States and abroad. It is the home of several world-renowned research collections: the Small-Grain Collection, the National Parasite Collection, and outstanding collections of fungi, nematodes, seeds, and nitrogen-fixing bacteria.

Organizationally, research in the Beltsville Area is divided among 10 institutes, a human nutrition center, an arboretum, and a special family economics group, each dealing with a major subject area such as animal science or plant protection. Each institute or center comprises several laboratories that focus on an aspect of the broader subject. (See p. 4.)

A research index located on pages 42 to 55 of this brochure indicates the person or persons to contact for information on specific research topics. The index is divided into the broad topics of Animals; Insects; Plants; Soil, Air, Water; and Human Nutrition, Family Resources.

Research Accomplishments in the Beltsville Area

Some major accomplishments of the Agricultural Research Service in the Beltsville Area are listed here, both the historical and recent accomplishments.

Historical Accomplishments

- Developed genetic concepts that laid the foundation for modern plant and animal breeding and proved the value of statistical methods in evaluating inherited characteristics in populations.

- Pioneered research on plant responses to variations in light quality and daylength which culminated in the chemical isolation of phytochrome, the photoreceptor that regulates many plant growth and development responses to light.

- Developed and introduced many pest-resistant potato varieties, from the famous 'Katahdin' potato of the 1930's to the new superior baking potato bred to grow in the Northeast—'BelRus'.

- Invented and developed the "bug bomb" (precursor of the aerosol can), saving thousands of lives from malaria and other tropical diseases during World War II and its aftermath.

- Developed the Beltsville Small White turkey.

- Contributed to the "Green Revolution" (a turning point in agriculture that drastically reduced world hunger) by identifying and supplying disease-resistant wheat to plant-breeding centers around the world.

- Originated high-quality, large-fruited blueberry varieties from the wild that started the new and valuable cultivated blueberry industry.

- Developed detergent chemical methods for determining the nutritional value of feedstuff—now widely used throughout the world in both human and animal nutrition.

- Conducted fundamental research that defined the energy requirements of the lactating dairy cow. These concepts led to a practical feeding system adopted by the National Academy of Science.

- Discovered and synthesized the chemicals that a variety of major insect pests emit to attract their mates—now being used for mass trapping and to survey insect populations for integrating pest-management programs.

- Discovered plant viroids—a new class of disease-causing particles 80 times smaller than viruses. Developed a practical test for the presence of viroids in potatoes.

- Developed methods to evaluate weed killing potential of chemicals that are now used worldwide by the agricultural chemicals industry.

- Developed the near-infrared reflectance spectroscopic technique for rapid evaluation of major quality constituents in food and agricultural products.

- Discovered that a group of protozoan parasites (Sarcocystis species), long thought to be harmless cysts in the muscles of cattle, sheep, and swine, actually can cause weight loss, produce abortion in pregnant animals, decrease milk yields, and even cause death.

- Developed a standardized reference diet for use as a research tool in human metabolic studies.

Recent Accomplishments

- Clinical mastitis is reduced 75 percent by inserting abraded plastic loops in cows' udders. Reduced infections resulted in increased milk yield averaging almost 4 pounds per cow per day.

- Human nutrition studies demonstrated that decreasing fat in the diet and increasing the proportion of fat from vegetable sources significantly reduces high blood pressure.

- Supplementing diets of healthy men and women with trace amounts of chromium restores mildly impaired glucose tolerance to normal.

- Technology has been developed that uses near-infrared light combined with computerized data analysis to instantly measure percent of body fat, water, and protein without harming the subject.

- A multiple-volume treatise of detailed taxonomic information has been developed on over 15,000 species of North American moths.

- Computerized databases and information files on beneficial organisms, primarily those of foreign origin, were developed as an aid in biological control.

- A new South American egg parasite of the Colorado potato beetle was successfully mass produced and shows great promise as an effective natural enemy of the beetle in potatoes, tomatoes, and eggplant.

- A new synthetic control for fire ants increases the ratio of drone ants to workers, slowly causing the ant colony to weaken and die. These pests infest 230 million acres in the South.

- In a cooperative effort with private industry, a parasite constituent that stimulates immunity has been genetically engineered—an important first step for a vaccine against coccidiosis, which costs U.S. poultry producers almost $300 million a year.

- Plant explorers introduced exotic new impatiens germplasm, and geneticists used ovule-culture to develop otherwise impossible hybrids to create new kinds of impatiens, a flower-garden bedding plant, that are now more popular than petunias.

- Determined that biologically active Brassinosteroids may be used to hasten maturity of various crop plants, such as potatoes.

- Nutrient deficiencies in corn and soybean can be detected from an aircraft or satellite using a nitrogen-gas laser. Plant leaves fluoresce in specific wavelengths that indicate their status of specified elements, such as iron, nitrogen, and potassium.

- Four snap bean germplasm lines resistant to all 28 races of *Uromyces phaseoli* (fungus that causes bean rust) that occur in the United States were released to plant breeders. Snap and dry beans are an important source of protein and energy in the human diet.

- A newly discovered chemical attractant will cause the spined soldier bug—a type of stink bug that eats other insects—to gather in areas where they may help the farmer control pest insects.

- New rice plants, grown only from pollen, can be chemically selected in the laboratory for increased protein and other desirable characteristics. One rice variety produced this way has 42 percent more lysine (an essential amino acid) than normal rice. Anther culture offers plant breeders a shortcut method of developing new varieties.

- The world's first and largest apple orchard grown from laboratory-cloned apple shoots is located at Beltsville.

- New technique using a laser beam can identify and separate X- and Y-chromosome-bearing sperm of farm animals. Procedure may permit livestock producers to select the sex of young animals for more efficient meat or milk production.

- A sugarbeet hybrid developed from lines with high taproot-to-leaf weight ratio produced 15 percent more sugar per acre of beets in recent field tests.

Agricultural Environmental Quality Institute

J.L. Hilton, Director
Room 233, Bldg. 001
Phone: (301) 344-3030

Scientists in the Institute search for ways to increase food and fiber production to meet the needs of a rapidly expanding world population. Emphasis is placed on developing practices that avoid or minimize hazards to the environment. The Institute comprises nine laboratories.

Analytical Chemical Lab
K.R. Hill, Research Leader
Room 114, Bldg. 306
Phone: (301) 344-2495

Chemists develop new or improved analytical techniques for detecting and analyzing pest-control chemicals in air, soil, water, and agricultural products and collect data on the distribution and breakdown products of these pesticides.

Insect Chemical Ecology Lab
R.L. Ridgway, Research Leader
Room 333, Bldg. 007
Phone: (301) 344-2028

Scientists conduct fundamental research on chemical and biological processes associated with the behavior and development of insects. Chemical messengers and mediators studied are of plant, animal, or synthetic origin and include pheromones, attractants, deterrents, repellents, and growth regulators. Applied research is conducted on chemicals that affect insects of national importance.

Insect Reproduction Lab
A.B. Borkovec, Research Leader
Room 119, Bldg. 306
Phone: (301) 344-2136

Scientists examine the physiological and biochemical processes and neuroregulators involved in insect reproduction and maturation to find methods or chemicals which will interfere with these processes.

Livestock Insects Lab
D.K. Hayes, Research Leader
Room 120, Bldg. 307
Phone: (301) 344-2474

To control arthropod pests of livestock, scientists investigate feed additives, fumigants, antifeedants, toxicants, and juvenoids. Basic studies on diapause (dormancy) delve into insect metabolism while applied research seeks to improve controlled release formulations.

Pesticide Assessment Lab
S.N. Fertig, Research Leader
Bldg. 1070
Phone: (301) 344-2845

The staff assembles and provides information on the benefits, risks, and economic value of pest-control technology essential for American agriculture. Specialists also coordinate the minor use pesticide program and provide chemical data on experimental materials being evaluated as pest-control agents.

Pesticide Degradation Lab
P.C. Kearney, Research Leader
Room 100, Bldg. 050
Phone: (301) 344-3533

The staff examines the fate of organic and inorganic pesticides in soils, plants, and aquatic and animal systems and cooperates with other agencies to establish effective criteria for assessing pesticides in the environment.

Soil-Microbial Systems Lab
D.D. Kaufman, Research Leader
Room 110, Bldg. 318
Phone: (301) 344-3163

Researchers study the effects of crop residues and soil organic matter on the chemical, physical, and microbiological properties of soils. Emphasis is placed on principles of organic matter recycling, microbial action on agricultural chemicals, the interaction of microbes on each other and with higher plants, and nutrient bioavailability. The aim is to improve soil productivity, plant health and nutrition, and the yield and quality of crops.

Soil Nitrogen and Environmental Chemistry Lab
J.R. Plimmer, Acting Research Leader
Room 228, Bldg. 007
Phone: (301) 344-3511

Fundamental research is done on the nitrogen cycle in soils, including nitrogen fixation and impacts of soil moisture and tillage practices. Scientists also study environmental chemistry of plant nutrients, herbicides, and other agricultural chemicals and develop practices to improve agronomic efficiency and reduce adverse environmental impacts.

Weed Science Lab
Judy St. John
Room 236, Bldg. 001
Phone: (301) 344-3873

Scientists work to improve the safety and efficiency of weed-control technology through basic and applied studies of factors controlling herbicide activity in plants and through regulation of weed seed germination and dormancy. Narcotic plant control is also studied.

Scientist examines an Achromobacter species isolated by Beltsville chemists in their studies of bacteria that degrade pesticides.

Soil sample being taken by lab technician for analysis to determine amount of nitrogen in the soil.

Scientist in the Insect Reproduction Lab adjusts operating temperature of a chromatograph after injecting insect tissue to obtain computer printout.

Male corn earworm beginning his mating dance on pheromonelike lure, demonstrating the lure's effectiveness.

Agricultural Systems Research Institute

S.L. Rawlins, Director
Room 128, Bldg. 007
Phone: (301) 344-2042

The primary mission of the Agricultural Systems Research Institute is to integrate scientific knowledge of production, processing, and marketing into systems, models, and other products for delivery to users to help solve major national problems. The Institute's research laboratories work to establish electronic communication and computer networks to provide access to data bases and models already on hand and to coordinate scientific efforts among teams and with potential users of the research information.

Hydrology Lab
A. Rango, Research Leader
Room 139, Bldg. 007
Phone: (301) 344-3490

Scientists test methodologies such as mathematical modeling and remote sensing to predict runoff and water yield. They study all phases of water movement and storage to provide a complete picture of watershed hydrology, then build on the results of smaller studies to describe broader geographical areas.

Modeling and Database Coordination Lab
S. Heller, Research Leader
Room 056, Bldg. 007
Phone: (301) 344-1709

Scientists focus on the development of data bases and predictive models for simulating the effects of key physical and biological factors on agricultural productivity and environmental quality. These models are then integrated to simulate major components of agricultural production and marketing systems.

Remote Sensing Lab
G. Hart, Research Leader
Room 107, Bldg. 007
Phone: (301) 344-2822

Remote sensing studies are aimed at the development of a basic understanding of the soil-plant-animal-atmosphere continuum in agroecosystems. Scientists develop procedures for utilizing remote sensing techniques for identifying crops and for measuring their acreage, stage of growth, and health as affected by disease, insects, other pests, and other factors such as soil moisture, temperature, and nutritional status.

Beltsville scientist using an infrared thermometer to calibrate microwave antennas above a test plot of sorghum.

Researchers in Beltsville study runoff from snowmelt using a computer programmed with artificial intelligence.

Animal Parasitology Institute

R. Fayer, Director
Room 100, Bldg. 1040
Phone: (301) 344-2201

The prime objective of this Institute is to develop ways to prevent, control, or eradicate parasitic infections in livestock and poultry, including those that also infect humans. The Institute's three laboratories occupy nearly 200 acres physically separated and secured from the other research areas to prevent parasitic contamination.

Biosystematic Parasitology Lab
J.R. Lichtenfels, Research Leader
Bldg. 1180
Phone: (301) 344-2444

Scientists in this Laboratory develop new information on the classification, distribution, and identification of parasites of animals, especially those of medical and veterinary importance, by utilizing classical morphology and molecular genetic techniques. The National Parasite Collection—one of the world's largest collections of animal parasites—is maintained by this Laboratory.

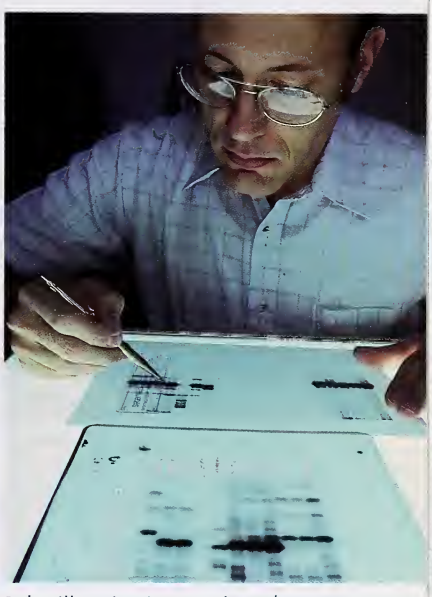
Helminthic Diseases Lab
Vacant, Research Leader
Bldg. 1040
Phone: (301) 344-2195

This Laboratory develops control procedures to reduce or eliminate economic loss and human health risks resulting from parasitic helminthic infections of ruminants, primarily cattle and sheep, and nonruminants, primarily swine. Both basic and applied studies are carried out on parasite biology and host-parasite relationships, with special emphasis on immunological and biochemical investigations. The information gained will guide the development of both biological- and chemical-control strategies, including vaccines.

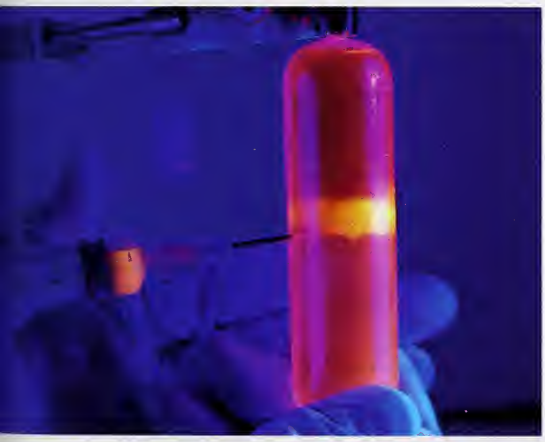
Protozoan Diseases Lab
M.D. Ruff, Research Leader
Bldg. 1040
Phone: (301) 344-1764

Scientists in this Laboratory develop methods to prevent or reduce losses from protozoan parasites of livestock and poultry, primarily chickens and turkeys. They conduct basic and applied research on the biology of the parasites, including their life cycle, development, and nutrient requirements; the pathophysiological mechanisms by which these parasites affect the host; and chemical and immunological methods to control parasites, including vaccines.

Scientist in Beltsville prepares to inject hybridoma-produced coccidia antibodies into chicks to test their effectiveness against coccidiosis.



Beltsville scientist examines the banding patterns formed from single bands of Trichinella *DNA that were electrically separated.*



Closeup of toxoplasma DNA being separated under ultraviolet light.

Animal Science Institute

L.W. Smith, Director
Room 217, Bldg. 200
Phone: (301) 344-3431

Institute scientists conduct research to increase livestock production efficiency and to improve the quality of animal products. Emphasis is on basic research, but applied work is also done to solve production problems in dairy and beef cattle, sheep, swine, turkeys, and other farm animals. The Institute has seven laboratories.

Animal Improvement Programs Lab
F.N. Dickinson, Research Leader
Room 10A, Bldg. 263
Phone: (301) 344-2271

Scientists investigate advanced statistical and computer methods for genetic improvement of economically important traits in dairy cattle. They implement advanced procedures to produce nationwide genetic evaluations and research improved technical procedures for obtaining and summarizing data in support of the National Cooperative Dairy Herd Improvement Program (NCDHIP).

Avian Physiology Lab
T.J. Sexton, Research Leader
Bldg. 262
Phone: (301) 344-2545

Scientists investigate the physiological and endocrinological factors that control reproduction in turkeys to improve reproductive performance of both the male and female breeder.

Meat Science Research Lab
A.W. Kotula, Research Leader
Room 105, Bldg. 201
Phone: (301) 344-2400

Research focuses on the composition, quality, and safety of meat. Studies seek to minimize microbial and biochemical deterioration of meat and to ensure freedom from harmful chemical residues. Scientists also develop data on specifications and standards for quality to enhance the acceptability of meat and meat products in world markets.

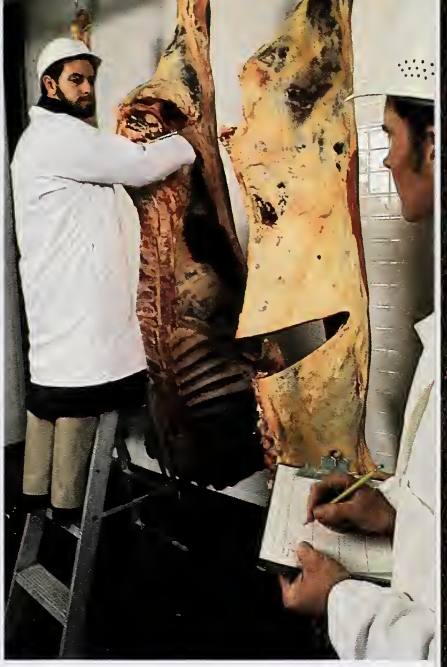
Milk Secretion and Mastitis Lab
R.H. Miller, Research Leader
Room 102, Bldg. 173
Phone: (301) 344-2330

Researchers study lactation and endocrine physiology in dairy cows to increase and sustain high milk yield. They also study various immunological defense mechanisms to lower the frequency and severity of mastitis infection.

Nonruminant Animal Nutrition Lab
N.C. Steele, Research Leader
Room 201, Bldg. 200
Phone: (301) 344-2222

Scientists seek to improve the efficiency of nonruminant livestock (swine and poultry) production by developing basic information on the nutritional and genetic factors that affect growth, production, and reproduction and by determining the nutritional, genetic, physiological, and microbiological interactions.

Reseacher at the Nonruminant Animal Nutrition Lab injecting 16-day-old shell-less turkey embryos with a metal solution to determine how the embryos metabolize trace elements.



Researchers in Beltsville grading carcasses for quality and yield.

Reproduction Lab
H.W. Hawk, Research Leader
Room 6, Bldg. 200
Phone: (301) 344-2836

Scientists work toward improving reproductive performance in dairy cattle and swine by several methods—regulating estrus and ovulation with natural and synthetic compounds, improving egg fertilization, reducing embryonic deaths, and developing methods for improving the preservation of boar semen. New techniques of cell and tissue culture and of gene insertion into embryos are used to manipulate and regulate reproductive processes.

Ruminant Nutrition Lab
T.S. Rumsey, Research Leader
Room 124, Bldg. 200
Phone: (301) 344-2267

Nutrition research is aimed at improving the efficiency of feedstuff conversion into meat and milk for human consumption. Basic research emphasizes the physiological and biochemical bases of feed intake, microbial degradation and digestion of feeds, absorption and transport of nutrients, and the biochemistry of the synthesis of meat and milk.

Beltsville Human Nutrition Research Center

W. Mertz, Director
Room 223, Bldg. 308
Phone: (301) 344-2157

The Center is concerned with determining human requirements for energy, protein, carbohydrates, lipids, vitamins, and minerals. It is also concerned with understanding the many interactions of these individual nutrients and their consequences for health.

Scientists investigate the nutritional qualities of foods including composition, biological interactions, and the availability of macronutrients and micronutrients. One laboratory provides data on the nutrient composition of foods so that sound diets can be recommended. This Center has five laboratories.

Carbohydrate Nutrition Lab
S. Reiser, Research Leader
Room 315, Bldg. 307
Phone: (301) 344-2396

Scientists study the effect of dietary carbohydrates on metabolic risk factors associated with such diseases as heart disease and diabetes. Metabolic processes receive special attention and the interactions between carbohydrates and other components of the diet. Population groups with different genetic predispositions are studied to identify those individuals at particular risk.

Energy and Protein Nutrition Lab
P.W. Moe, Research Leader
Room 214A, Bldg. 308
Phone: (301) 344-2059

Scientists determine human energy requirements as influenced by dietary factors and energy expenditures. They also examine metabolic responses to protein and minerals in the diet and their interaction.

Lipid Nutrition Lab
J.T. Judd, Research Leader
Room 126, Bldg. 308
Phone: (301) 344-2306

Scientists use human volunteers and experimental animal models to study the effects of dietary lipid and cholesterol on physiological parameters related to good health. Research focuses upon the essential fatty acids and the bioavailability of vitamins involved in lipid metabolism.

Nutrient Composition Lab
G.R. Beecher, Research Leader
Room 102, Bldg. 161
Phone: (301) 344-2356

Reliable information on the nutrient content of food is essential to the development of good dietary practices. Scientists in this Laboratory develop new analytical methods and assay techniques for determining nutrients in foods. Special emphasis also is given to sampling techniques to ensure that representative samples are selected from the U.S. food supply for testing. Food composition data are provided to the USDA's Human Nutrition Information Service and other groups.

Dieticians preparing a special diet for study with human volunteers.

Researchers at the Beltsville Human Nutrition Center measuring trace elements.

Vitamin and Mineral Nutrition Lab
J.C. Smith, Research Leader
Room 215, Bldg. 307
Phone: (301) 344-2351

A proper balance of vitamins and minerals is essential for good health. Scientists in this Laboratory determine requirements and modes of action for specific vitamins and minerals. They identify chemical forms and biological availability. Sophisticated analytical instrumentation and techniques are developed for assessment of trace elements and vitamins in human nutrition.

Biosystematics and Beneficial Insects Institute

L. Knutson, Director
Room 1, Bldg. 003
Phone: (301) 344-3182

The Institute emphasizes basic research on the classification of plants, fungi, nematodes, insects and mites of the world and provides an international identification service. Many of the Institute's scientists are housed in the Natural History Museum of the Smithsonian Institution in Washington, D.C., where the National Collection of Insects is maintained. Programs also include research on biological control of pests by introduced natural enemies, genetics of beneficials, and biosystematic and biocontrol documentation. The Institute has three laboratories.

Beneficial Insects Lab
H. Shimanuki, Research Leader
Room 201, Bldg. 476
Phone: (301) 344-2205

Scientists study the best means of controlling diseases and pests of the honey bee and provide a diagnostic service for beekeepers. Research also focuses on methods for biologically controlling insect pests and weeds with introduced natural enemies. Basic research emphasizes biosystematics and genetics of insects and mites of importance to biological control. The Laboratory serves as the USDA Biological Control Documentation Center, developing and maintaining extensive computerized documentation systems dealing with natural enemies of insects, weeds, and other agricultural pests.

Systematic Botany, Mycology, and Nematology Lab
A.Y. Rossman, Research Leader
Room 313, Bldg. 011A
Phone: (301) 344-3364

Scientists study the systematics of plants, fungi, and nematodes of economic value to agriculture to permit accurate identifications and to provide an understanding of their relationships and distribution in the ecosystem. The staff maintains major taxonomic collections and nomenclature files. Information is made available on practically everything known about fungi—including mushrooms, yeasts, molds—that are beneficial or harmful to plants, animals, and humans. The world's largest collection of preserved fungus specimens is housed here.

Systematic Entomology Lab
D.R. Miller, Research Leader
Room 4, Bldg. 003
Phone: (301) 344-3183

Scientists develop biologically predictive systems of classification of insects and mites of the world. This basic research supports biological control, pest exclusion, forestry, and other broad areas of agricultural and biological research and action programs. Responsibilities also include an international identification service that is closely dependent upon the Smithsonian Institution's U.S. National Collection of Insects.

Researcher examines a collection of forest-devastating gypsy moths to help identify specimens submitted to the Systematic Entomology Lab.

Parasitic female wasps, imported from South America, prepare to oviposit in the eggs of the Colorado potato beetle in studies by Beltsville scientists to control this pest.

Family Economics Research Group

C. Hefferan, Research Leader
Room 441, Federal Building
Hyattsville, Maryland 20782
Phone: (301) 436-8461

Studies highlight the economic problems of families. Economic well-being is influenced by family economic behavior and by general economic conditions. Research focuses on management practices, use of resources, and patterns of savings that are most effective in helping families achieve their financial goals. Special studies are conducted on the cost of raising a child and conditions affecting farm families. The staff also publishes *Family Economics Review*, a quarterly publication of research on economic problems of families.

Shopper compares unit costs of various sizes and brands of food items.

Horticultural Science Institute

M. Faust, Director
Room 130, Bldg. 003
Phone: (301) 344-3338

Through its four laboratories, the Institute seeks optimum ways to originate, grow, protect, harvest, store, and deliver superior fruit, vegetable, and ornamental plants and products to consumers at minimum cost. Scientists cooperate to develop desirable new pest-resistant cultivars and new efficient production and postharvest handling practices that decrease energy use and ensure the safety and health of workers and users.

Florist and Nursery Crops Lab
R.H. Lawson, Research Leader
Room 101, Bldg. 004
Phone: (301) 344-3570

Scientists develop improved lines of florist and nursery crops as well as improved methods for virus detection and disease diagnosis. New methods in cell culture and genetic engineering are used to improve performance of whole plants. Biological pest-control practices developed from the study of insect behavior and ecology help to reduce dependence on chemical pesticides.

Fruit Lab
E.L. Civerolo, Research Leader
Room 119, Bldg. 004
Phone: (301) 344-3567

Research generates new knowledge about berries and tree fruits. New varieties of strawberries, blackberries, and blueberries hybridized here combine disease resistance with superior characteristics. Pioneering studies on micropropagation by tissue-culture techniques are being carried out. Scientists study fruit diseases, searching for biological controls, and evaluate the role of nutrients in improving fruit quality and of chemicals in regulating growth.

Horticultural Crops Quality Lab
A.E. Watada, Research Leader
Room 112, Bldg. 002
Phone: (301) 344-3128

Researchers work to identify, measure, and protect desirable qualities in fruits, vegetables, and flowers from the time of harvest until they reach the consumer. Emphasis is on cellular biology of fruit ripening and senescence. Improved methods of controlling postharvest diseases and of storing or handling perishable products to reduce deterioration are developed.

Scientist in the Vegetable Lab examines cabbage plants for resistance to pests and diseases.

Vegetable Lab
R.E. Webb, Research Leader
Room 219, Bldg. 004
Phone: (301) 344-3380

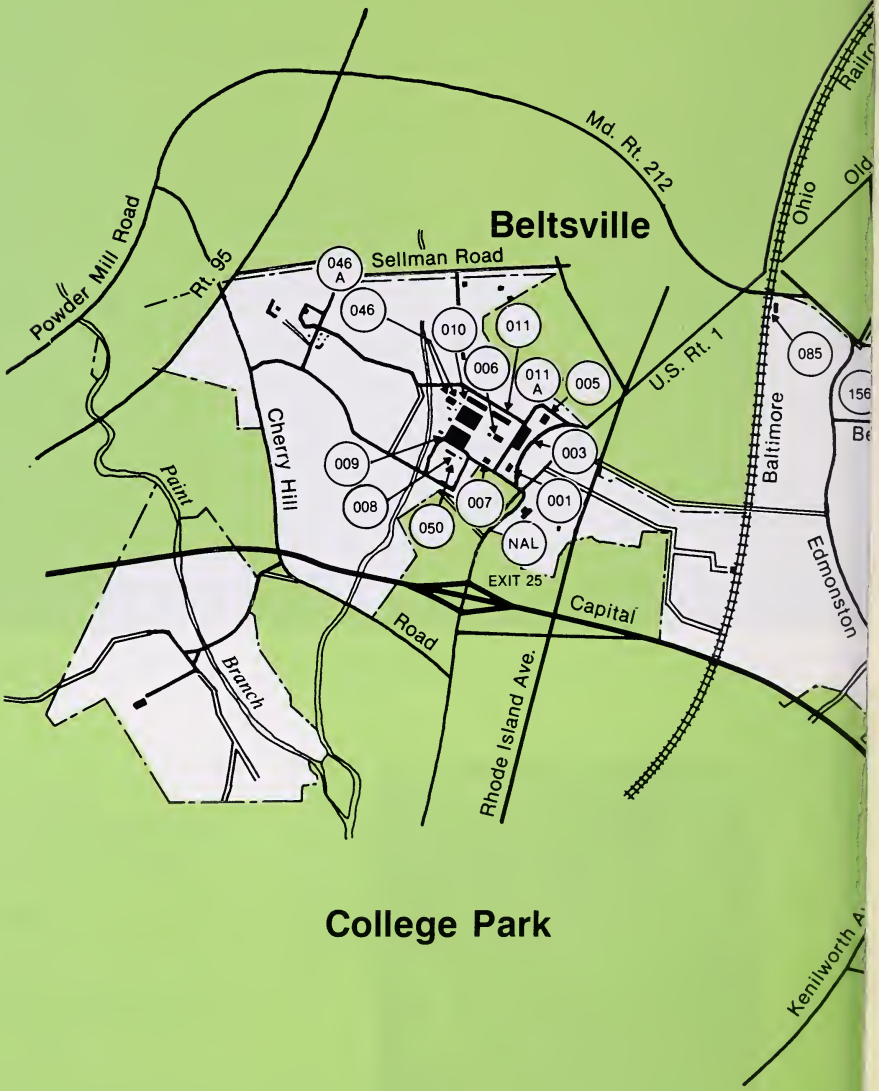
Scientists conduct breeding programs and related research on the major vegetable crops to develop resistance to disease and insects, increase yields, adapt vegetables to various farming conditions, and improve their quality. Integrated pest control using biological means including host resistance, crop management, and chemicals is an important aspect of the work.

Scientist in Beltsville examining replica of virus' RNA (ribonucleic acid) to determine if plant tissue is viral infected.

Researcher in the Horticultural Crops Quality Lab measuring the storage life of apples.

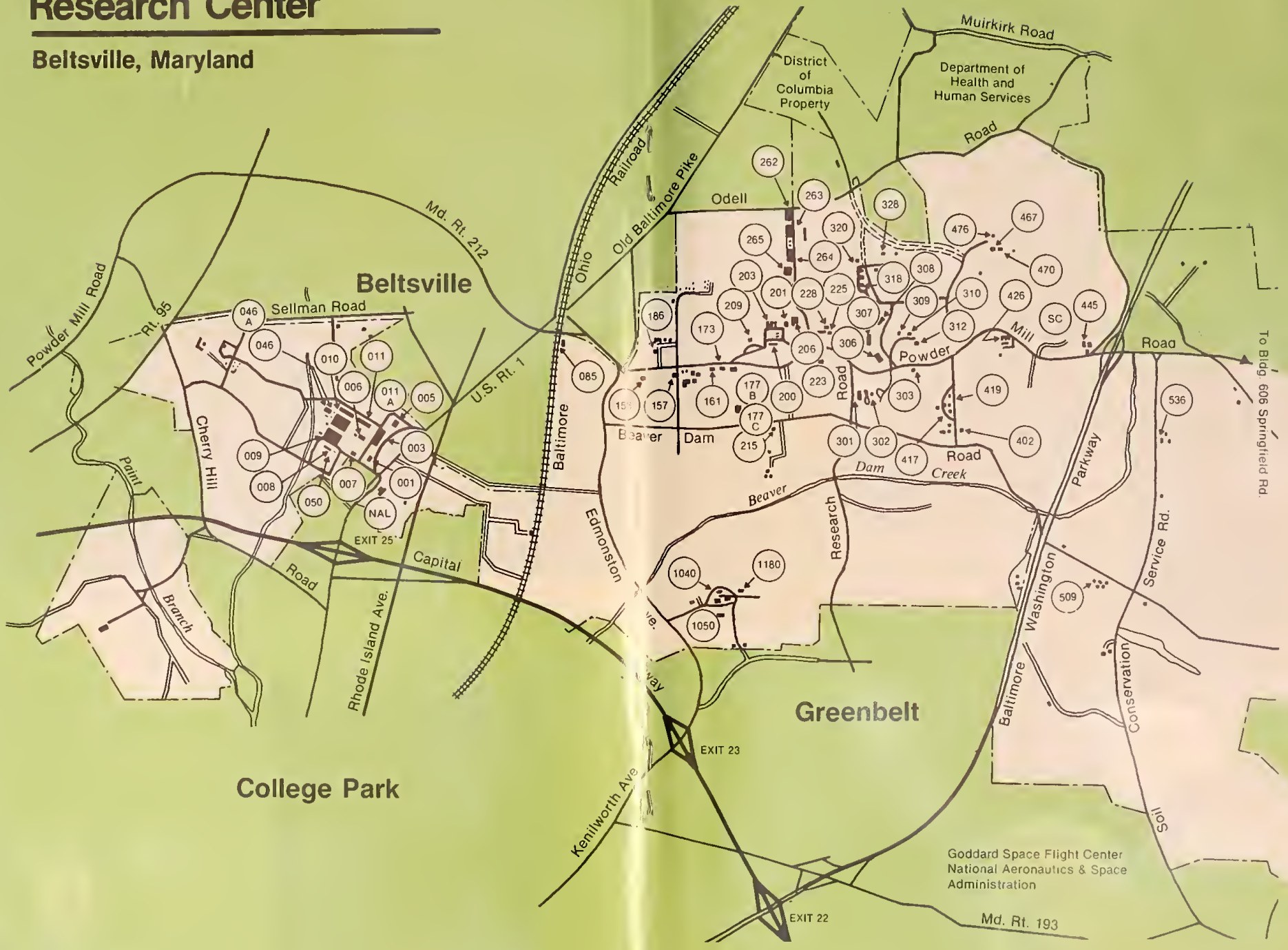
Beltsville Agricultural Research Center

Beltsville, Maryland



Beltsville Agricultural Research Center

Beltsville, Maryland



Plant Genetics and Germplasm Institute

A.K. Stoner, Director
Room 127, Bldg. 001
Phone: (301) 344-3235

The Institute is responsible for the collection, conservation, and improvement of plants and seeds by genetic and cultural methods. Scientists travel worldwide to collect plants and seeds that are conserved and distributed as germplasm throughout the world. The germplasm is used in research to understand and improve the quality and productivity of many crops. The Institute has five laboratories or units.

Database Management Unit/Germplasm Resources Information Network (GRIN)
J.D. Mowder, Database Manager
Room 130, Bldg. 001
Phone: (301) 344-1666

A computerized data retrieval system is maintained for the collection and dissemination of information on U.S. plant germplasm collections. Data processing expertise is provided to support the database that consists of information on over 400,000 discrete accessions of plants. This system serves plant scientists and other researchers by providing accurate taxonomic, geographic, evaluation, inventory, and cooperator information.

Germplasm Introduction and Evaluation Lab
R.E. Perdue, Jr., Research Leader
Room 21B, Bldg. 265
Phone: (301) 344-2431

Personnel introduce, evaluate, distribute, and exchange germplasm needed in research and guide scientists in locating sources of germplasm and crop collections. The staff maintains over 80,000 accessions of wheat, oats, barley, and rye, and 15,000 rice accessions plus limited quantities of other crops and acts as a focal point in exchange of germplasm from the United States throughout the world. A data bank on distribution, ecological attributes, and nutritional values of economic plants and weeds is maintained here.

Germplasm Quality and Enhancement Lab
J.J. Murray, Research Leader
Room 335A, Bldg. 001
Phone: (301) 344-3643

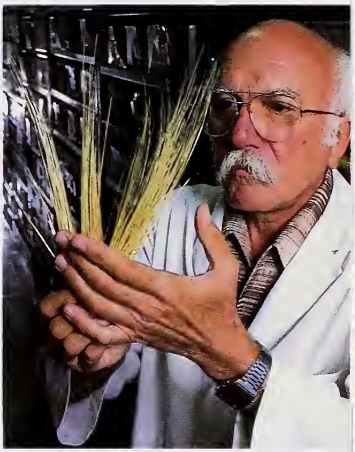
Basic and applied research in genetics, breeding, pathology, entomology, seed quality, and agronomy allows scientists to develop better cultural practices and better varieties of crop plants—alfalfa, soybeans, forage grasses, turfgrasses, tobacco, cereal grains, and other crops. This information is essential for the development of agricultural commodities with enhanced quality characteristics for domestic and foreign markets.

U.S. Plant Introduction Station
B. Parliman, Research Leader
Glenn Dale, Maryland
Phone: (301) 344-3003

Staff conducts research on improved methods of plant propagation by cuttings and tissue culture and detection and characterization of new viruses and other pest organisms. Scientists receive, establish, propagate, and evaluate for disease infection all plant introductions that must be quarantined upon arrival in the United States.

Scientist in the Plant Molecular Genetics Lab examining the structure of a soybean DNA segment.

Scientists use computer system to search for plant samples in the Germplasm Resources Information Network (GRIN).



Curator, National Plant Germplasm Collection, examining sample of wheat for length of awn.

Plant Molecular Genetics Lab
B.F. Matthews, Research Leader
Room 102, Bldg. 006
Phone: (301) 344-3466

Scientists seek to identify, isolate, and characterize the genes that control the yield of plants and the quality attributes of plant products. Once identified, scientists will seek to alter or transfer the genes to increase the nutritional value and productivity of economically important crop plants.

Plant Physiology Institute

Vacant, Director
Room 221, Bldg. 001
Phone: (301) 344-3036

The mission of this Institute is to develop basic information on plant function and reaction to environment that will provide a foundation for cultural and genetic improvement of crop yield and quality. Soil, air, light, water, temperature, and related environmental conditions as well as hormones affecting plant growth are studied in five laboratories.

Nitrogen Fixation & Soybean Genetics Lab
D.L. Keister, Research Leader
HH-19, Range 1
Phone: (301) 344-1723

Researchers study the basic physics, biochemistry, and genetics of how plants take up, store, and use nitrogen from the atmosphere. Special emphasis is on soybean improvement, such as higher yields, disease and insect resistance, and more efficient nitrogen fixation. Personnel maintain the USDA *Rhizobium* Culture Collection.

Plant Hormone Lab
J.D. Anderson, Research Leader
Bldg. 050
Phone: (301) 344-3063

Scientists study basic physiology and biochemistry of plant hormones and related metabolic events with regard to their action and interaction in plant growth, development, and senescence. The information is aimed at increasing the efficiency of crop production and improving methods of preserving crops after harvest.

Plant Photobiology Lab
W.J. VanDerWoude, Research Leader
Bldg. 046A
Phone: (301) 344-3607

The regulation of basic physiological, biochemical, and biophysical processes in plants by light and other environmental factors is studied to identify control mechanisms in photosynthesis and photomorphogenesis. This information is used to develop new strategies for crop improvement and increased economic yield.

Plant Stress Lab
W.P. Wergin, Research Leader
Room 206, Bldg. 001
Phone: (301) 344-3143

Plants are exposed to air pollutants, toxic materials, low temperatures, water deficiencies, and various nutrient levels. In basic and applied research programs, scientists study how biochemical, cultural, or genetic methods may be used to increase plant tolerance to these environmental stresses.

Tissue Culture & Molecular Biology Lab
Lowell Owens
Research Leader
Room 116, Bldg. 011A
Phone: (301) 344-2103

Researchers develop techniques to modify the genes of plant cells and reconstruct an improved plant from a single cell or a group of cells. Special emphasis is on crop improvement, disease and insect resistance, and higher yields.

Scientists in the Tissue Culture and Molecular Biology Lab inducing cell fusion electrically in a study on gene transfer.

Scientists in the Nitrogen Fixation & Soybean Genetics Lab comparing the foliage on two varieties of soybeans inoculated with the fast-growing strain of Chinese Rhizobium: (left) lush foliage on 'Peking', a Chinese soybean variety, and (right) American variety 'Lee'.

Scientist at the Plant Stress Lab examines the root of a wheat variety particularly sensitive to aluminum toxicity.

Scientists in the Plant Stress Lab, Beltsville, study nematode anatomy with the aid of an electron microscope that magnifies nematode egg thousands of times with 3-D effect.

Plant Protection Institute

B.Y. Endo, Director
Room 165B, Bldg. 011A
Phone: (301) 344-3848

Institute research is aimed at controlling pests and diseases of plants and bees. Fundamental and practical studies encompass the insects, nematodes, and micro-organisms that cause losses to crop production. The Institute's five laboratories specialize in various aspects of plant protection.

Insect & Nematode Hormone Lab
J.A. Svoboda, Research Leader
Room 6, Bldg. 467
Phone: (301) 344-2389

Scientists search for, isolate, identify, and synthesize chemicals from insects, plants, and other natural sources that control or disrupt the normal hormone-regulated processes in insects and nematodes. These natural and synthetic chemicals are tested for potential use in controlling insects and other pests, parasites, and pathogens of agricultural importance.

Insect Pathology Lab
J.L Vaughn, Research Leader
Room 214, Bldg. 011A
Phone: (301) 344-3689

Micro-organisms—bacteria, protozoa, viruses, and mycoplasma—that cause diseases in insect pests are identified and thoroughly studied. Scientists then conduct preliminary experiments on the production and safety of promising microbial agents for insect control. Studies are also conducted on the ecology of insect pathogens and the epizootiology of insect diseases to discover the factors contributing to their effective use for controlling pests.

Microbiology and Plant Pathology Lab
R.E. Davis, Research Leader
Room 253, Bldg. 011A
Phone: (301) 344-2745

Research on plant viruses and diseases formerly thought to be caused by viruses has led to the discovery of spiroplasmas, viroids, and small viral satellites that reproduce only in plants infected by other viruses. Scientists apply the most novel methods of biotechnology to study these and other plant pathogens and the diseases they cause. They seek to develop new concepts of disease control, including gene pyramiding, induced resistance, biocontrol, and bioreguiation of plant/pathogen response mechanisms. Personnel are also responsible for the quarantine of sugarcane germplasm as well as the etiology and detection of pathogens.

Nematology Lab
R. Huettel, Research Leader
Room 165A, Bldg. 011A
Phone: (301) 344-3660

Basic and applied research is directed to the study and control of plant and insect parasite nematodes. Host-parasite research provides basic concepts for the control programs that involve both chemical and biological systems that are ecologically sound. Nematode control is essential to integrated pest-management programs.

Scientist examines developed film for potato spindle tube viroid (PSTV) using a new method devised in Beltsville for detecting this disease.

Head end of parasitic root-knot nematode that attacks crop roots by injecting liquids into the root cells and drawing nutrients from them. This damage to the root structure can result in stunting the crop roots.

Researchers in the Insect and Nematode Hormone Lab study computer printouts of chemicals that control insect development.

Soilborne Diseases Lab
G.C. Papavizas, Research Leader
Room 274, Bldg. 011A
Phone: (301) 344-3682

Researchers develop and combine several methods—biological, cultural, chemical, and genetic—to control plant diseases caused by soilborne pathogens. To this end they study the environmental factors affecting pathogen survival and interactions among these pathogens and other micro-organisms in the soil.

Sensors and Control Systems Institute

G.E. Vanden Berg, Director
Room 103, Bldg. 307
Phone: (301) 344-3423

The primary aim of this Institute is to discover sensor technologies for measuring the resources used in or products from agricultural production, processing, and distribution systems. The Institute develops mathematical models and control strategies that enable sensor technologies to be used singly or in combination as part of feedback loops to control a specific system. The focus is on new principles of measurement and their use in sensing and control systems. The current research programs are conducted in two laboratories.

Instrumentation Research Lab
K.H. Norris, Research Leader
Room 103, Bldg. 002
Phone: (301) 344-3650

Researchers develop novel instruments and techniques to measure chemical and physical properties of agricultural products. Emphasis is on nondestructive methods for measuring product composition using transmitted and reflected light and near-infrared energy.

Sensing Systems Lab
L.A. Liljedahl, Research Leader
Bldg. 303
Phone: (301) 344-2237

Engineering research seeks a better understanding of the fundamental principles needed to develop more efficient and functional equipment and systems for crop production under field and greenhouse conditions. Special attention is given to energy efficiency and effects of light radiation on plants.

Scientist in the Instrumentation Research Lab using a computerized spectrophotometer to determine the amounts of chlorophyll, lycopene, and carotene in a tomato.

U.S. National Arboretum

H.M. Cathey, Director
U.S. National Arboretum
Washington, D.C. 20002
Phone: (202) 475-4829

The U.S. National Arboretum in Washington, D.C., conducts research on trees, shrubs, and herbaceous plants and educates the public regarding these plants. It has a major herbarium of botanical specimens for research and plant identification. In addition, the Arboretum publishes botanical findings and provides technical information to the public.

The Arboretum exchanges seed and plant material with other scientific institutions throughout the world. The purpose of this exchange is to provide researchers with needed genetic resources and to enrich the educational display collections at the Arboretum. Selections improved by the Arboretum reach the public through the nursery industry. The Arboretum consists of three units.

Educational Services
E.A. Neumann, Curator,
Activity Center
Phone: (202) 475-4858

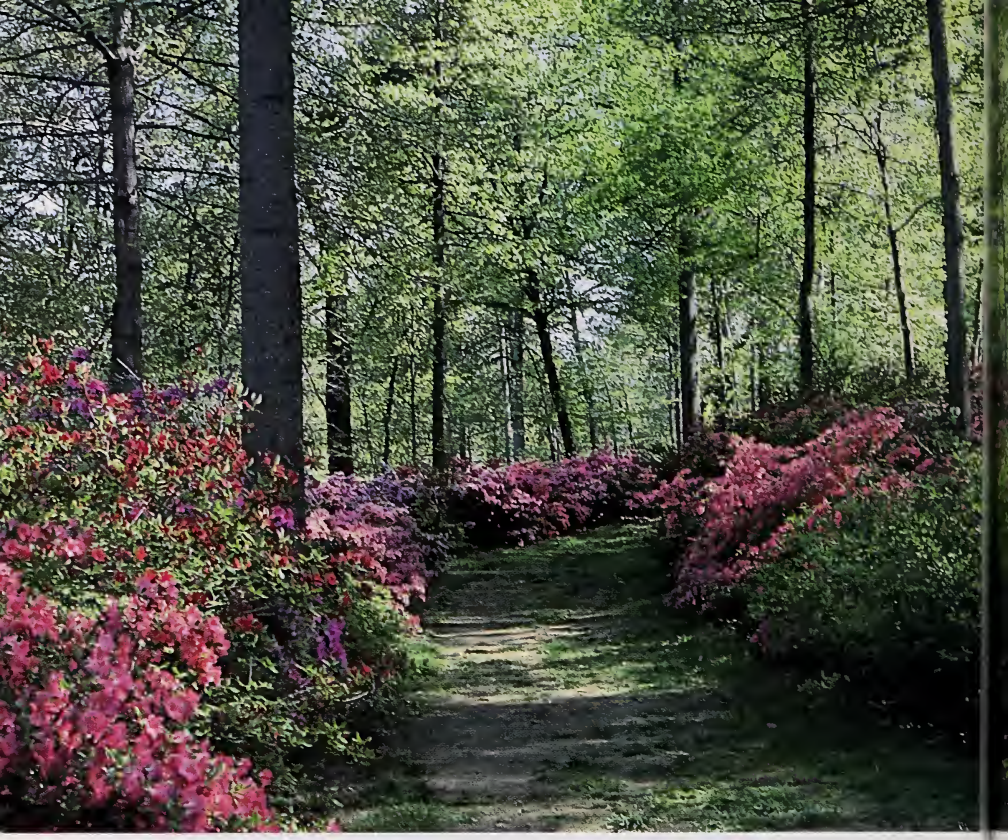
The National Arboretum offers visitors horticultural demonstrations, lectures, exhibits, and films. In cooperation with local chapters of various plant societies, it hosts a series of free flower shows.

Guided tours are conducted through its gardens and plant collections, the natural areas, the herbarium, and plant-propagation facilities. The tours are conducted by Arboretum staff members, by specialists from various plant societies, and by the Volunteer Guide Service of the National Capital Area Federation of Garden Clubs, Inc. Organized groups requiring the services of a guide should make arrangements for this service well in advance of the proposed visiting date.

Gardens and Collections Unit
S.G. March, Supervisor
Room 116, Administration Bldg.
Phone: (202) 475-4821

At the center of the National Arboretum's educational and research programs are its labeled and carefully documented plant collections. These collections are arranged in generic or botanical groupings, gardenlike or naturalistic plantings, and demonstration plantings.

The gardens include 70,000 azaleas and over 400 varieties of camellias. There are 300 or more species and cultivars of crabapples, 700 hollies, and over 1,500 dwarf conifers. There are collections of dogwood, magnolia, firethorn, viburnum, crapemyrtle, flowering cherries, lilacs, daffodils, ferns, and wildflowers. Collections of boxwood, peonies, and daylilies are planted in formal garden settings.

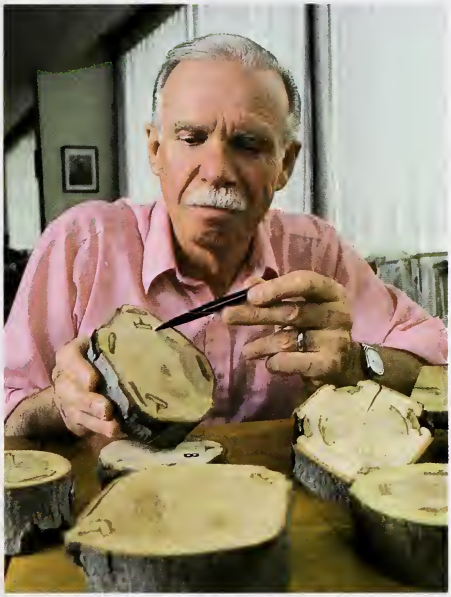


The Azalea Trail, a popular walk each spring up the Arboretum's Mount Hamilton, is a showplace for many varieties, including several of the famed Glenn Dale azalea hybrids bred by the Arboretum's first director, Benjamin Y. Morrison.

Research Unit
A.M. Townsend, Research Leader
Room 127, Administration Bldg.
Phone: (202) 475-4836

Woody plant research receives major emphasis in the Arboretum program. Current research emphasizes taxonomic and cytological studies on the identification and classification of cultivated woody plants, the breeding of improved varieties, and the evaluation of existing, newly derived, or newly introduced cultivars. Some attention is given to problems of plant propagation and to assisting other agencies and institutions through the dissemination of needed plant stocks, materials, and information.

Accurate identification is essential to all plant research. The National Arboretum herbarium, a worldwide collection of 500,000 dried, pressed specimens, is essential for the botanical study and identification of cultivated plants and related plant-breeding projects at the Arboretum and for the support of cooperative programs within the Department of Agriculture. The herbarium staff also answers technical inquiries and loans its collections to visiting scientists and others nationally and internationally.



Scientist at the National Arboretum demonstrates "a tough-tree" test to determine the ability of trees to wall off their wounds and protect themselves from decay.

Reception area of the National Herb Garden, the newest attraction at the National Arboretum.

Other ARS and Related Activities at the Center

National Program Staff
T.J. Army, Deputy Administrator
Room 125, Bldg. 005
Phone: (301) 344-3084

This Staff in the Agricultural Research Service was established to ensure that the agricultural research program remains nationally oriented. Staff scientists serve as advisers to researchers and administrators in developing policy and program and in making reviews and evaluations.

Budget and Program Management Staff
J.L. Victor, Director
Room 102, Bldg. 005
Phone: (301) 344-3057

Staff members provide leadership in formulating, presenting, and reviewing ARS budgets and budget activities.

Information Staff
H.W. Kelley, Director
Room 307, Bldg. 005
Phone: (301) 344-2264

The staff reports on research through news media and to Congress and to industry; carries out an internal communications program for the Administrator; publishes *Agricultural Research* magazine; is responsible for quality control of technical publications issued by the Agency; and plans and maintains a National Visitor Center in Beltsville, MD.

Administrative Management
T.J. Clark, Administrator
Room 305, Bldg. 003
Phone: (301) 344-3646

Administrative Management provides administrative leadership, advice, and management support services for ARS nationwide and the National Agricultural Library. These services include personnel management, financial management, administrative services, and contracting. Administrative Management also is responsible for the radiological safety program within the Department of Agriculture.

Financial Management Division
J.L. Wilson, Director
Room 251, Bldg. 003
Phone: (301) 344-3532

Personnel in this division provide direction and guidance management for the ARS fiscal areas.

Radiological Safety Staff
R.D. Jarrett, Radiological Safety Officer
Room 228, Bldg. 001
Phone: (301) 344-4248

The Staff is responsible for the proper acquisition, safe use, and disposal of radioactive materials and/or equipment that emits potentially hazardous ionizing radiation.

General Services Division
S.R. Leaman, Director
Room 315, Bldg. 003
Phone: (301) 344-3522

This Division provides policy direction and technical guidance for property management, safety and health management, and office-system management. This Division also provides operational services for Headquarters, BARC, National Arboretum, and the NAL in the areas of real property, personal property, and records and mail operations.

National Agricultural Library
J. Howard, Director
Room 109A, NAL
Phone: (301) 344-4248

The National Agricultural Library (NAL), which is housed in a 15-story building, contains the free world's largest collection of printed materials on agriculture and related sciences (1.6 million volumes). Computers and other modern techniques provide instant information to researchers, technicians, and the general public. NAL is international in scope, embraces many languages, and covers all the sciences supporting agricultural research.

Other USDA Agencies at the Center

- Agricultural Marketing Service
- Animal and Plant Health Inspection Service
- Food Safety and Inspection Service
- Office of Transportation
- Soil Conservation Service
- Federal Grain Inspection Service

Other Federal Agencies at the Center

- Environmental Protection Agency
- Food and Drug Administration

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